

Using Behavioral Economics to Improve ART Adherence

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The motivation for this presentation...

1. ART adherence is often suboptimal (Gill et al., 2005)
2. The problem commonly is behavioral (although structural barriers also matter) (Schroeder, 2007)
3. Existing approaches have met limited success (Simoni et al., 2013)
4. BE may offer new insights for adherence as it has for other health behaviors (obesity, smoking) (Rice, 2013)

in a 
nutshell

To support the claim that Behavioral Economics (BE) offers new insights I will...

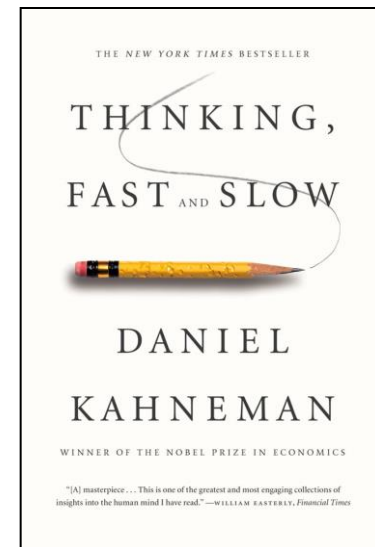
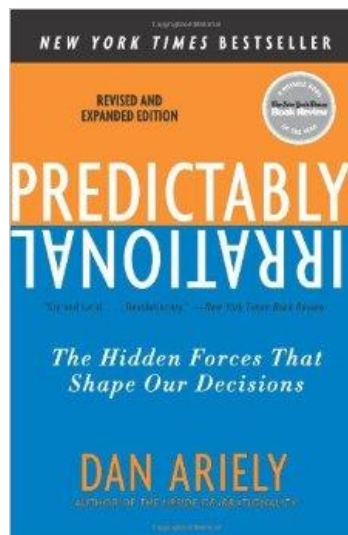
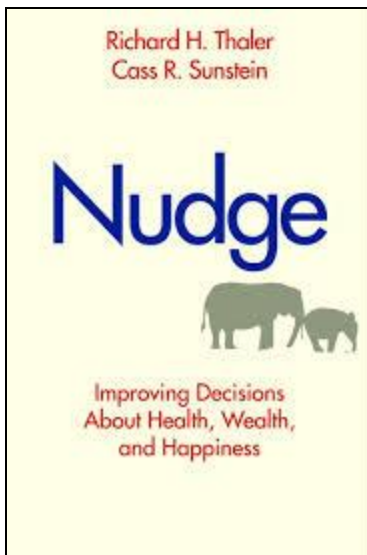
1. Give a short introduction to BE and key decision-making errors (biases)
2. Look at ART adherence through a BE lens
3. Present empirical evidence showing that
 - a. Biases are common
 - b. They lead to low adherence
 - c. Small nudges (incentives) can overcome them
4. Discuss the role of mHealth from a BE perspective
 - a. Show the mHealth potential in sub-Saharan Africa
 - b. Give examples of BE/mHealth applications in Uganda

Part 1: BE in five minutes or less...

Behavioral Economics \neq Economics as you
may know it...

What is BE not?

- Different from traditional economics that assumes that people
 - “...can think like Albert Einstein, store as much memory as IBM’s Big Blue, and exercise the willpower of Mahatma Gandhi” (Thaler and Sunstein, 2008)



What is BE?

- It is based on the economics insight that people weigh **costs** and **benefits** of a decision



What is BE?

- It is **economics** in the sense that people make decisions based on **costs** and **benefits**
- Explicitly recognizes limitations of human rationality
- Builds on new insights from psychology
- Key: People are predictably irrational



Working definition of BE

- BE is a coherent framework based on economics and complemented by psychology to
 - examine decision-making situations,
 - predict specific errors (biases), and
 - *create novel ways to address them*

BE successfully applied to other health behaviors



BE successfully applied to other health behaviors



BE successfully applied to other health behaviors



BE successfully applied to other health behaviors



Why not HIV?



Part 2: ART adherence as a BE decision context

BE studies decision-making contexts

People tend to make good decisions if

- The decision is simple
 - Action and outcome are clearly linked
 - Good feedback
- Vaccination; aspirin

ART adherence does not fit this description:

- Long-term behavior needed
- Costs of adherence now, benefits far in the future
- Low salience of HIV threat and adherence progress
- Infrequent feedback

These ART characteristics make certain biases likely:

- Myopia (giving in to short-term temptations at expense of long-term health)
- Optimism (not realizing that one is myopic)
- Overconfidence (not taking enough precautions to stick to adherence plans)
- Salience (HIV threat may slip one's mind over time)

Background on empirical evidence

- NIMH-funded 3-year R34 in Uganda's capital Kampala
- Rewarding Adherence Program (RAP)
- Clients have been on ART for at least two years and show treatment fatigue, i.e. have adherence problems
- N=153
- **Biases measured at baseline, then adherence measured over 4 months using MEMS caps**

Bias 1: Myopia

- HIV characteristic relevant for bias: Costs of pill-taking in the present, benefits in the future
- Likely Bias: Myopia
- Definition: giving in to short-term temptations at expense of long-term health
- Impact: procrastination



☐ NOW
☒ LATER

Empirical evidence - Myopia

- Measurement: “Imagine you won a prize and can either have 5\$ now or 10\$ later”
- Prevalence in the sample: 36%
- Impact on adherence: 15% points lower probability to show 90% adherence [$p=0.001$]



Bias 2: Overoptimism (Lack of sophistication)

- HIV characteristic: little feedback about adherence in clinical settings
- Definition: not realizing one is prone to give in to myopia
- Impact: failure to learn from one's past suboptimal performance

Measurement:

“How many doses missed in the last month?”

98% thought they missed fewer than 5%



Bias 3: Overconfidence

- Definition: overestimating one's ability to deal with a bias, even if aware of it
- Impact: not preparing a decision environment conducive to good adherence
- HIV characteristic: daily, active, life-long decision-making needed for optimal adherence



Empirical evidence - Overconfidence

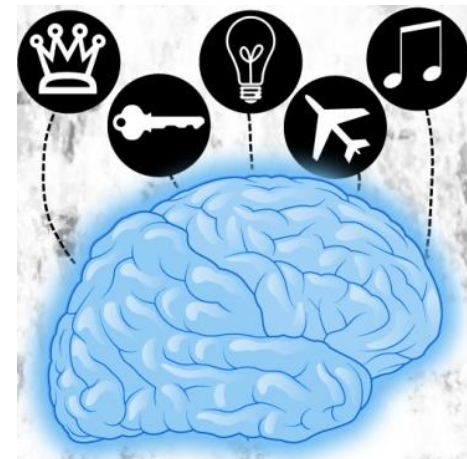
Measurement: Do you think you can adhere better than most clinic patients?

Prevalence in the sample: 20%

Impact on adherence: 8% points lower probability to achieve 90% adherence [$p=0.04$]

Bias 4: Salience

- Salience of HIV threat: may slip people's mind over time (more pressing short-term problems)
- Salience of importance of high adherence: little feedback / unlearning
- Definition: acting on information coming most easily to mind
- Impact: disregarding information that is not presently on the person's mind



Empirical evidence - Salience

Measurement:

1. Recent AIDS death among family/friends
2. Recently been reminded of ART benefits

Prevalence:

1. Recent Death: 92%
2. Reminded of ARV benefits: 33%

Impact on 90% adherence:

2. Reminded of ARV benefits: 17% points higher

Summary of the empirical evidence

1. We measured biases at baseline using simple questions
2. We found that the biases are common in a sample of HIV clients in Uganda
3. We measured adherence over next 4 months using MEMS caps
4. We found that biases associated with lower adherence

Potential uses of these insights

- For screening:
 - Questions to get at biases used above are simple
 - Require little time investment (~10 mins)
 - Biases are largely orthogonal to observable characteristics (provide additional information)
- For developing interventions:
 - Myopia → small rewards for healthy short-term behaviors
 - Overoptimism → feedback is important (mHealth)
 - Salience → importance of (event-specific) reminders

Part 3: Rewarding Adherence Program (RAP)

- Research question: how can we 're-motivate' these clients?
- Constraint: resource-constrained environment
- Observation: prize drawings popular in Uganda
- Idea: implement an 'adherence lottery' based on high adherence

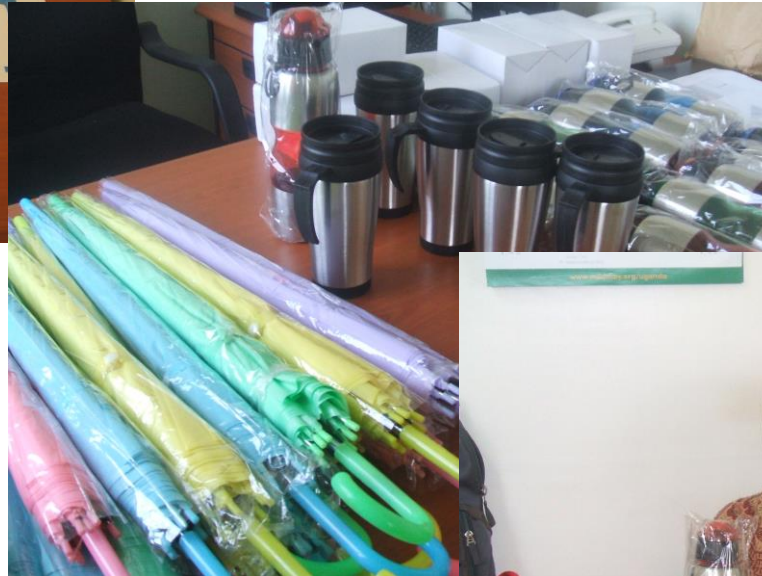
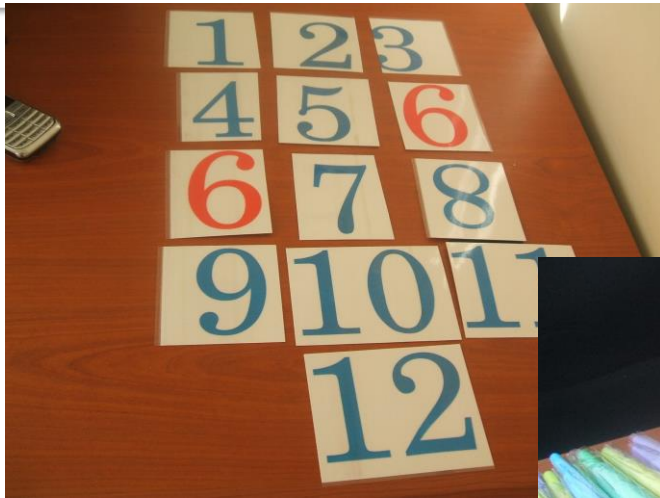
BE biases addressed by RAP

- **Myopia:** providing immediate benefits of a healthy behavior
- **Optimism:** leads to enrolment in the program
- **Salience:** increased by rewards for high adherence
- **Mood:** adding a fun element associated with adherence

RAP – study design

- 2 intervention groups (n=50 each), 1 control group (n=50)
 - one group eligible if come on the day they are scheduled
 - one group eligible based on 95% MEMS-measured adherence
 - control group: usual care, will participate in RAP after year 1
- Expected value of prize: ~2 USD per year, six drawings per year

RAP – drawing a prize



RAP intervention effects

- After 4 months, those in the intervention group have...
 - 8 percentage points higher mean adherence
 - 7 percentage points increased chance of showing 95% adherence
- Future research questions:
 - Implementation at scale?
 - Duration of effects?

Part 4: Behavioral Economics and mHealth



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From BE perspective, key obstacles for adherence are...

1. Lack of reliable measurement (mostly self-reports)
2. Lack of frequent feedback (most feedback in physical provider interactions)
3. Lack of targeted nudges (currently mostly general support)

Some mHealth functions relevant for BE

- Measurement: on body, continuous
 - Incentives work best when based on objective, verifiable outcomes
 - Allows (continuous) monitoring and self-monitoring
- Real-time data transmission and feedback
 - Incentives work best when feedback happens in close temporal proximity to the target action
- Automatization of measurement, data transmission, and feedback
 - Designing incentive schemes without human capital requirements
 - Recent work by Jessica Haberer and Kevin Volpp
- Novel applications
 - Geocoding allows targeting nudges based on physical location of the person
 - Biomarkers

Advantages of mHealth

- Reach: stay in contact with hard-to-reach (for example mobile) populations
 - Mobile phones by now common in sub-Saharan Africa
 - Smartphones (and hence internet) increasingly becoming a reality
- Cost: Low-cost way to improve provider/patient contact
- Leverage scarce human resources

Example 1:
SMS reminders
to improve
ARV adherence
in Ugandan youth



Mobile and smart phones a reality in sub-Saharan Africa

- Over 80% of adolescents either have a phone or have regular access to one

Our sample:

- 42% own their phone
- 21% have no electricity but have a cell phone in house
- Average weekly spending on SMS messages ~1.50 USD
- 26% use the phone to access internet (and many more use internet cafes, school computers, etc.)

Example 2:
Leveraging peer
competition to
improve adherence



Description

- Intervention group 1: weekly feedback by SMS on own adherence measured by wisepill

Message: *“Good job, you achieved 80% adherence this week”*

- Bias addressed: overoptimism (provide a reality check)

Description

- Intervention group 2: weekly feedback by SMS on own adherence measured by wisepill

&

Information about adherence in the participant's peer group

Message: *"You had 80% adherence last week, but your friends had 90%, do you think you can do better?"*

- Aims to create a social norm
- Implementation fully automatic, no provider input needed

Conclusion

- Behavioral economics may be a valuable tool to think about adherence issues
- Discussed characteristics of ART adherence as a decision-making context
- Pointed out main behavioral biases interfering with better adherence
- Early results indicate that
 - Behavioral biases are common
 - They impact adherence
 - Can be overcome/remedied using BE-type interventions
- mHealth is a great tool to transmit BE-based ideas, pointed out some areas for future research

Acknowledgments

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Thank you!

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